The challenges of Climate Change and the COP21: ambition and aims

Minh Ha-Duong

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PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

The challenges of Climate Change and the COP21: ambition and aims

Dr Minh Ha Duong

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Clean Energy and Sustainable Development Laboratory

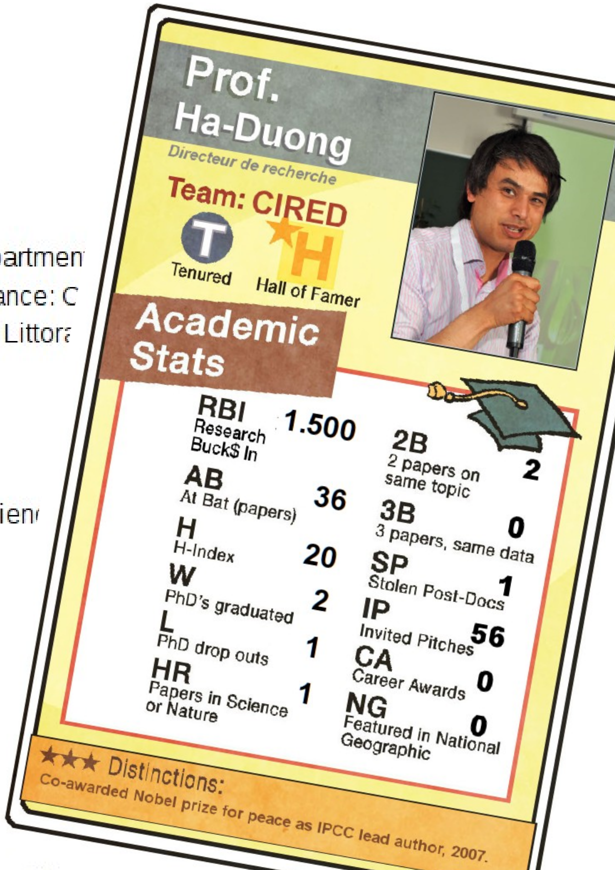
Mission

The Clean Energy and Sustainable Development (CleanED) lab is an international and interdisciplinary research team contributing to the green growth of the energy sector in Vietnam. Established in December 2014 with support from USTH and French Embassy, the CleanED lab hosts today four researchers from France and Vietnam, three doctoral fellows and two internationally qualified staff under the direction of Dr. Minh Ha-Duong.

Our expertise ranges from engineering to public policy on:

- Natural resources characterization and management
- Biomass and waste to energy conversion process technologies
- Energy systems optimization from smart grid to national plans

The CleanED lab is a working place for researchers, doctoral fellows and students from USTH's Energy departmen welcome Bachelor and Master level interns. Most are coming from or going to our partner laboratories in France: C BioWooEB/CIRAD, LAGEP/Université de Lyon, LABEX ARBRE/Université de Lorraine, LOG/Université du Littora other USTH consortium members, and our partner institute in Vietnam: IES/VAST.



Facilities

The CleanED lab office and experimental room are both located on the Campus of Vietnam Academy of Scien Hoang Quoc Viet, Cau Giay, Hanoi.

About me

My research is on energy, climate change, society, economics and uncertainty. I am interested in imprecise probabilities, especially using possibility theory for scenario-making and the Transferable Belief Model for expert opinion fusion, with applications to environmental and energy economics issues such as climatic change and carbon capture and storage…

I also work on the social and economic aspects of carbon capture and storage. My CCS blog in French is at CaptageStockageCO2.eu. I also commit prose at my homepage on CIRED website.

Here is the formal CV, there is the informal summary (thanks PhD comics;), the LinkedIn and the bibliometric link.

Minh Ha-Duong's Publication List

Energy, climate, society economics & uncertainty

Articles in peer-reviewed journals

36. Nguyen Trinh Hoang Anh and Minh Ha-Duong. **Perspective of CO_2 capture & storage (CCS) development in Vietnam: Results from expert interviews.** *International Journal of Greenhouse Gas Control*, 37:220-227, June 2015.

35. Jeff M. Bielicki, Guillaume Calas, Richard S. Middleton, and Minh Ha-Duong. **National corridors for climate change mitigation: Managing industrial CO_2 emissions in France.** *Greenhouse gases: science and technology*, 3 (4):262-277, June 2014.

34. Minh Ha-Duong and Venance Journé. **Calculating nuclear accident probabilities from empirical frequencies.** *Environment Systems and Decisions*, 34 (2):249-258, May 2014.

33. Olivier Boucher, Piers M. Forster, Nicolas Gruber, Minh Ha-Duong, Mark G. Lawrence, Timothy M. Lenton, Achim Maas, and Naomi E. Vaughan. **Rethinking climate engineering categorization in the context of climate change mitigation and adaptation.** *WIREs Clim Change*, 5 (1):23-25, 2014.

32. Patrice Dumas and Minh Ha-Duong. **Optimal growth with adaptation to climate change.** *Climatic Change*, 117 (4):691-710, April 2013.

31. Marta Benito-Garzón, Minh Ha-Duong, Nathalie Frascaria-Lacoste, and Juan Fernández-Manjarrés. **Extreme climate variability should be considered in forestry-assisted migration.** *BioScience*, 63 (5):317, 2013.

30. Marta Benito-Garzón, Minh Ha-Duong, Nathalie Frascaria-Lacoste, and Juan Fernández-Manjarrés. **Habitat restoration and climate change: dealing with climate variability, incomplete data and management decisions with tree translocations.** *Restoration Ecology*, 21 (5):530-536, 2013.

29. Minh Ha-Duong and Rodica Loisel. **Actuarial risk assessment of expected fatalities attributable to carbon capture and storage in 2050.** *International Journal of Greenhouse Gas Control*, 5:1346-1358, 2011.

28. Nhan Thanh Nguyen, Minh Ha-Duong, Thanh C. Tran, Ram M. Shrestha, and Franck Nadaud. **Barriers to the adoption of cleaner and energy efficient technologies in Vietnam.** *GMSARN International Journal*, 4 (2):89-104, June 2010.

27. Nhan Thanh Nguyen, Minh Ha-Duong, Sandra Greiner, and Michael Mehling. **Improving the clean development mechanism post-2012: A developing country perspective.** *Carbon and Climate Law Review*, 1 (4):76-85, 2010.

26. Minh Ha-Duong, Alain Nadaï, and Ana Sofía Campos. **A survey on the public perception of CCS in France.** *International Journal of Greenhouse Gas Control*, 3 (5):633-640, September 2009.

25. Minh Ha-Duong. **What is the price of carbon? Five definitions.** *Survey and Perspectives Integrating Environment & Society*, 2 (1), June 2009.

Transition to low carbon world

Renewable energy technologies set new installation records as their contribution to the global energy mix continued to climb in 2013.
Renewable power capacity jumped more than 8 percent in 2013, accounting for over 56 percent of net additions
It now has the potential to account for over a fifth of world electricity generation.

Renewables 2014 Global Status Report

Climate negociations since 1992

1992
UNFCCC
Rio

2007
COP 13
Bali

2009
COP 15
Copenhag.

2010
COP 16
Cancun

2011
COP 17
Durban

2012
COP 18
Doha

2013
COP 19
Varsovie

2014
COP 20
Lima

2015
COP 21
Paris

Bali process

Durban platform

1997
Protocol
Kyoto

Starts 2005
No USA
27% of GHG emissions.
39 countries
- 5,2% over 2008-2012 relative to 1990

Bali roadmap
Towards a post-2012 agreement in 2009

Copenhaguen fiasco

Cancun agreement
Engagements de financement et de limitation des émissions à 2020, mise en place d'instance sur le financement, d'adaptation et le transfert de techno.

Bali roadmap end

Décision :
Accord de principe sur une 2[ème] période d'engagement du PK et création de la plateforme de Durban pour un accord en 2015

UNFCCC

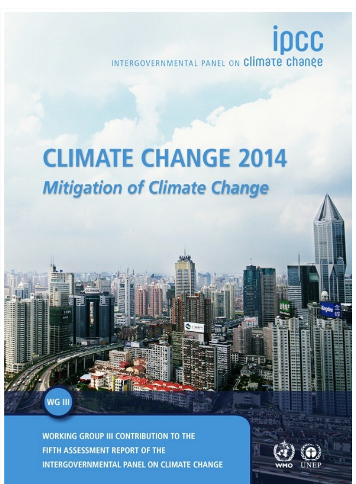
United Nations Framework Convention on Climate Change

IPCC

Intergovernmental Panel on Climate Change

COP

Conferences of Parties



Science

Policy

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IPCC Fifth Assessment Report
Synthesis Report

The IPCC Synthesis Report

- Integration of three Working Group Reports of the 5th Assessment, 2013-2014
  - WG I : The Physical Science Basis
  - WGII: Impacts, Adaptation and Vulnerability
  - WG III: Mitigation of Climate Change

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The IPCC Synthesis Report

- Written by 60 authors from Working Group reports
- Chaired by the IPCC Chair R.K. Pachauri
- Member governments approved the SPM on 1st November 2014 (total membership of IPCC is 195 governments)

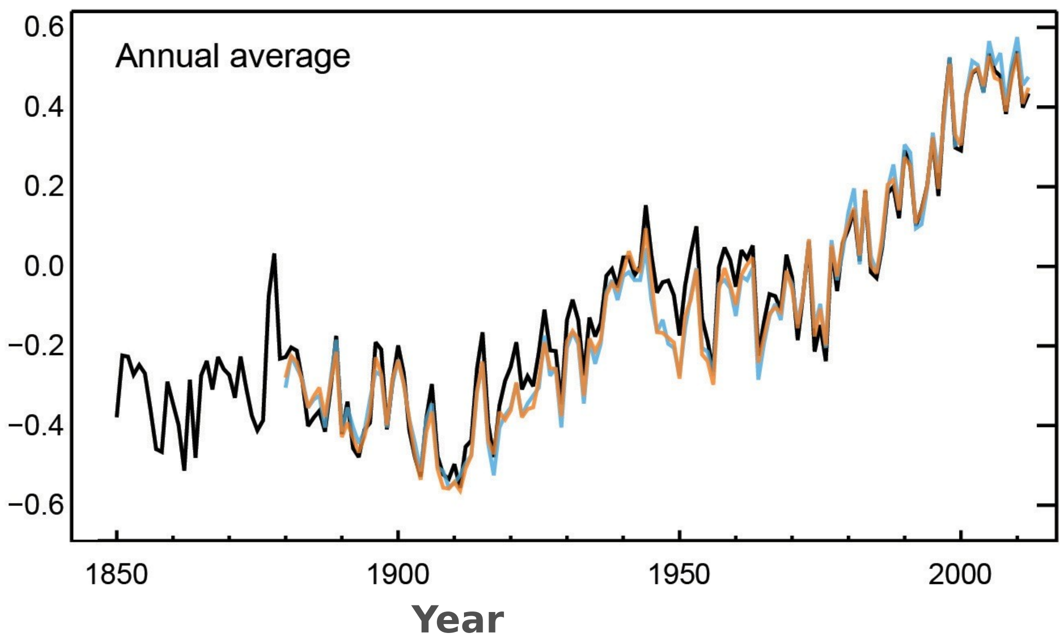
Key Messages

- Human influence on the climate system is clear
- The more we disrupt our climate, the more we risk severe, pervasive and irreversible impacts
- We have the means to limit climate change and build a more prosperous, sustainable future

AR5 WGI SPM, AR5 WGII SPM, AR5 WGIII SPM

Humans are changing the climate

It is extremely likely that we are the dominant cause of warming since the mid-20th century



Globally averaged combined land and ocean surface temperatures

AR5 WGI SPM

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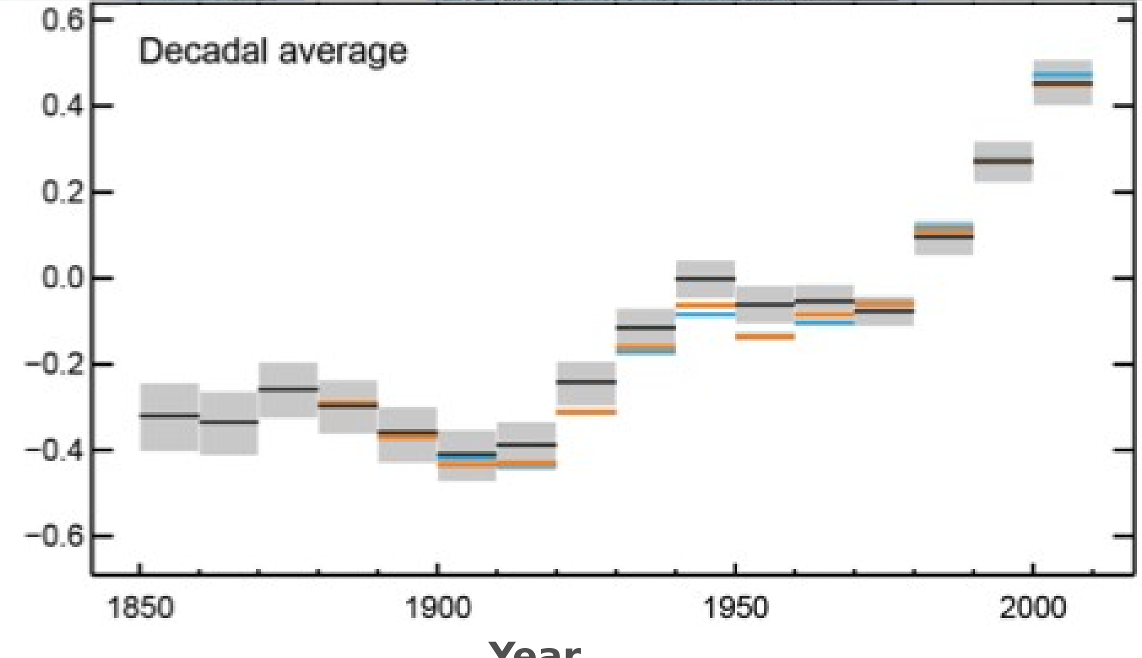
WMO UNEP

Temperatures continue to rise

Each of the past 3 decades has been successively warmer than the preceding decades since 1850



Globally averaged combined land and ocean surface temperatures

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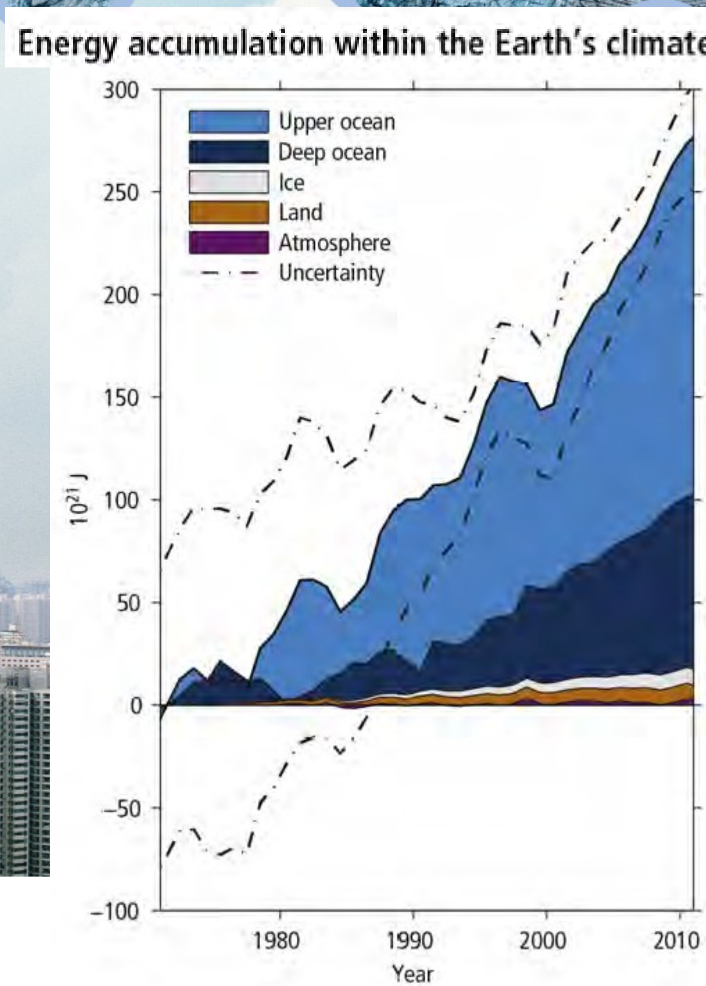
Oceans absorb most of the heat



- More than 90% of the energy accumulating in the climate system between 1971 and 2010 has accumulated in the ocean
- Land temperatures remain at historic highs while ocean temperatures continue to climb

AR5 SYR

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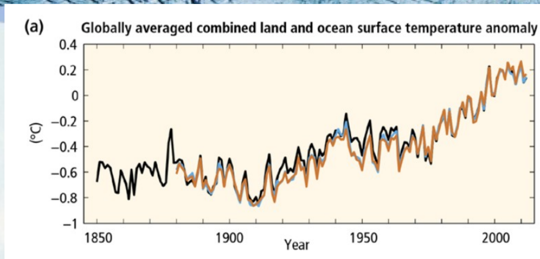
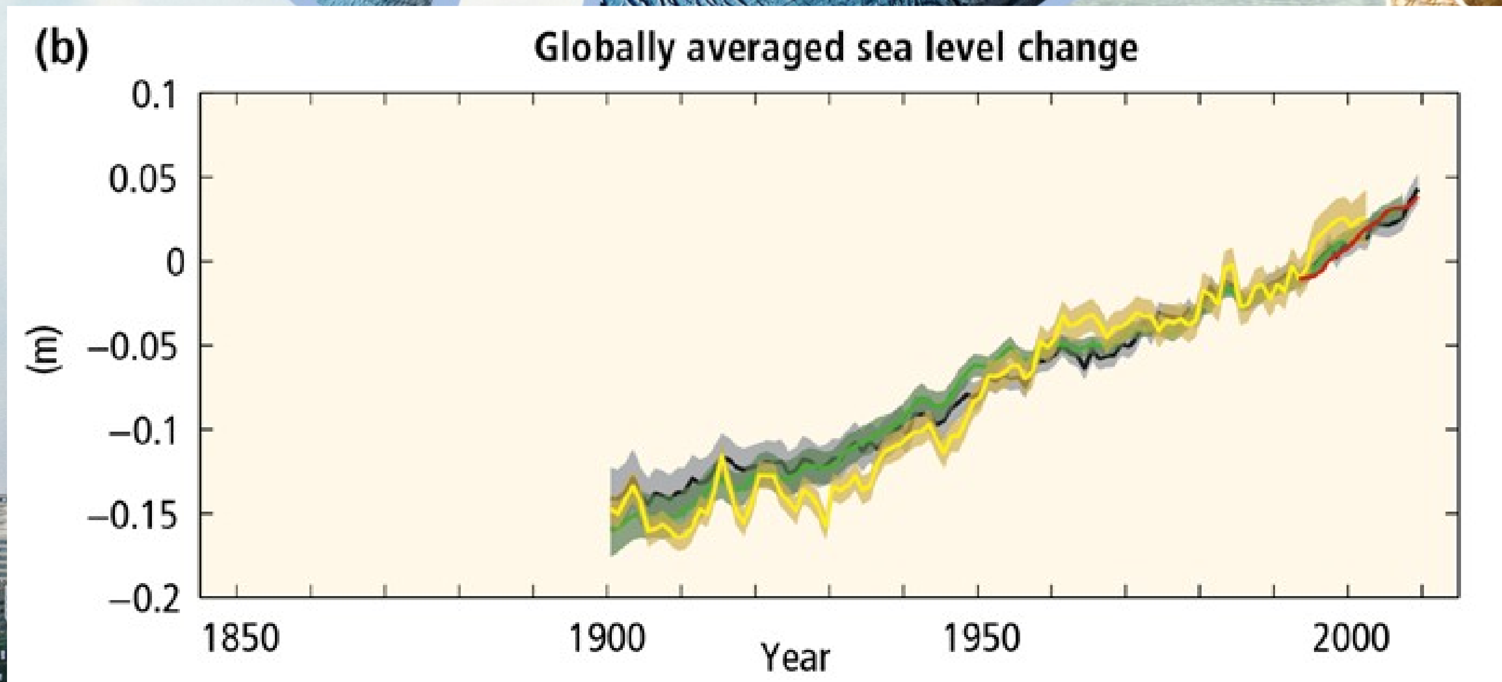

(a)
Globally averaged combined land and ocean surface temperature anomaly
(°C)
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−1
1850
1900
1950
2000
Year


(b)
Globally averaged sea level change
(m)
0.1
0.05
0
−0.05
−0.1
−0.15
−0.2
1850
1900
1950
2000
Year

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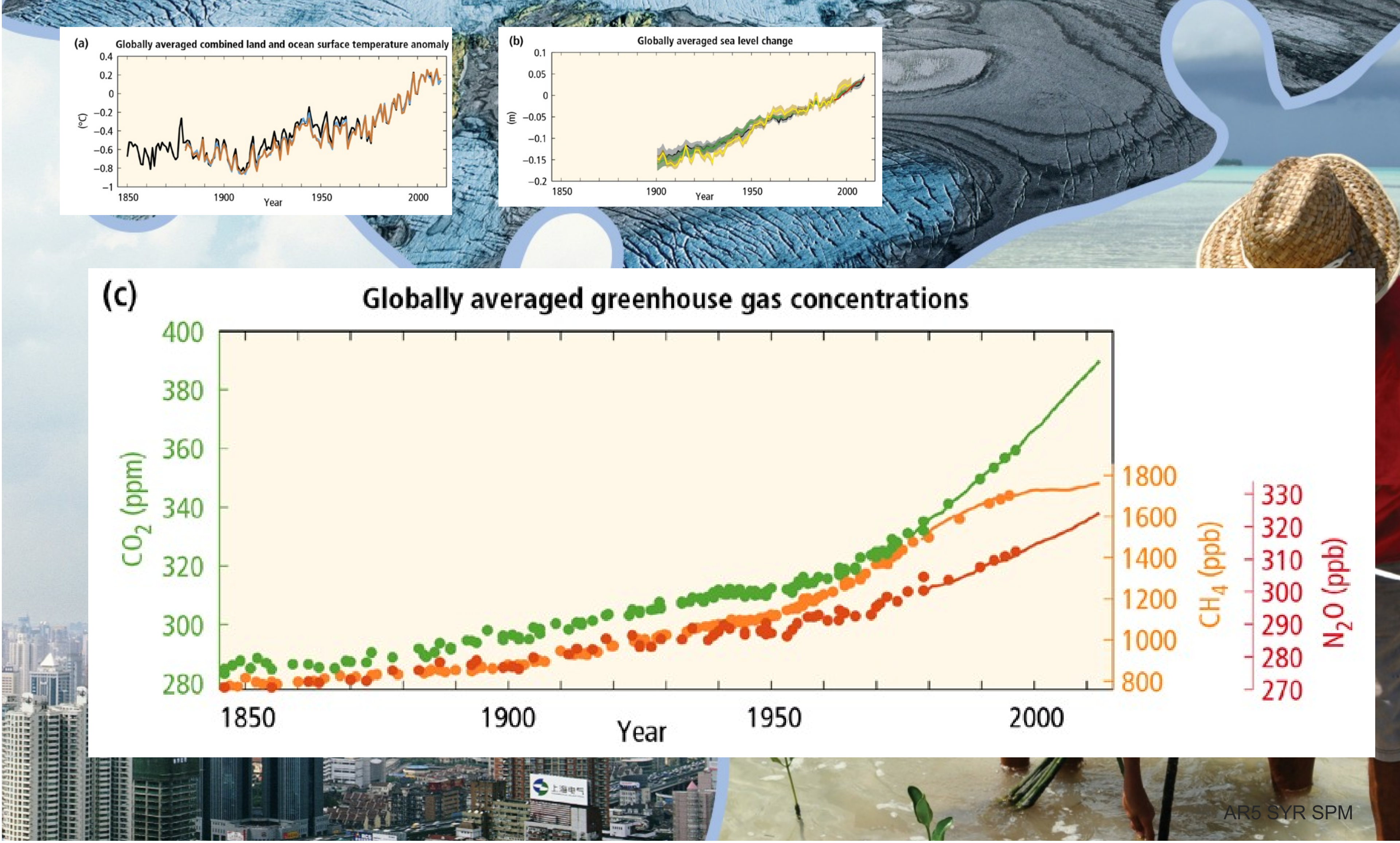
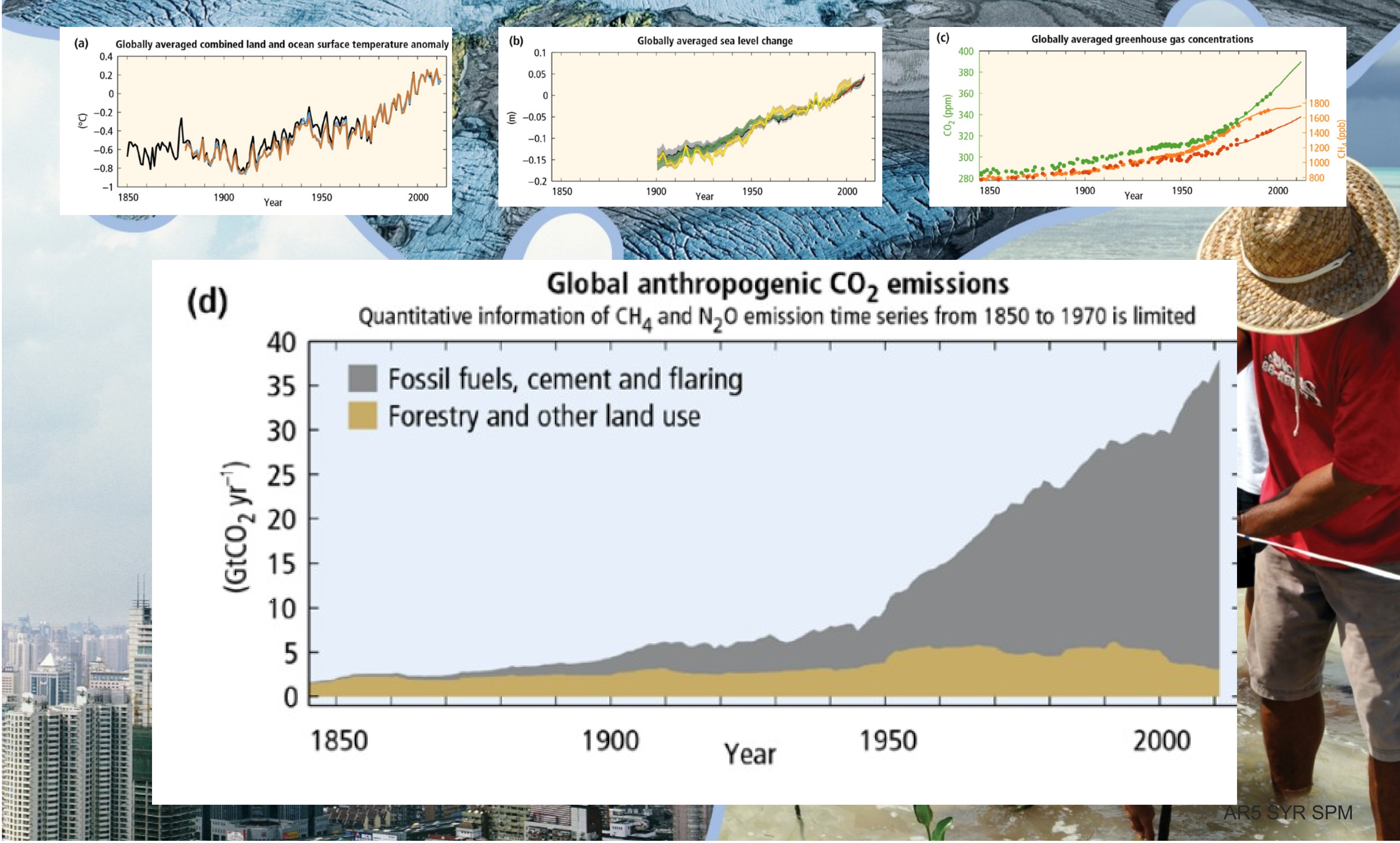

(a)
Globally averaged combined land and ocean surface temperature anomaly
(°C)
Year
(b)
Globally averaged sea level change
(m)
Year
(c)
Globally averaged greenhouse gas concentrations
CO_2 (ppm)
CH_4 (ppb)
N_2O (ppb)
Year
AR5 SYR SPM



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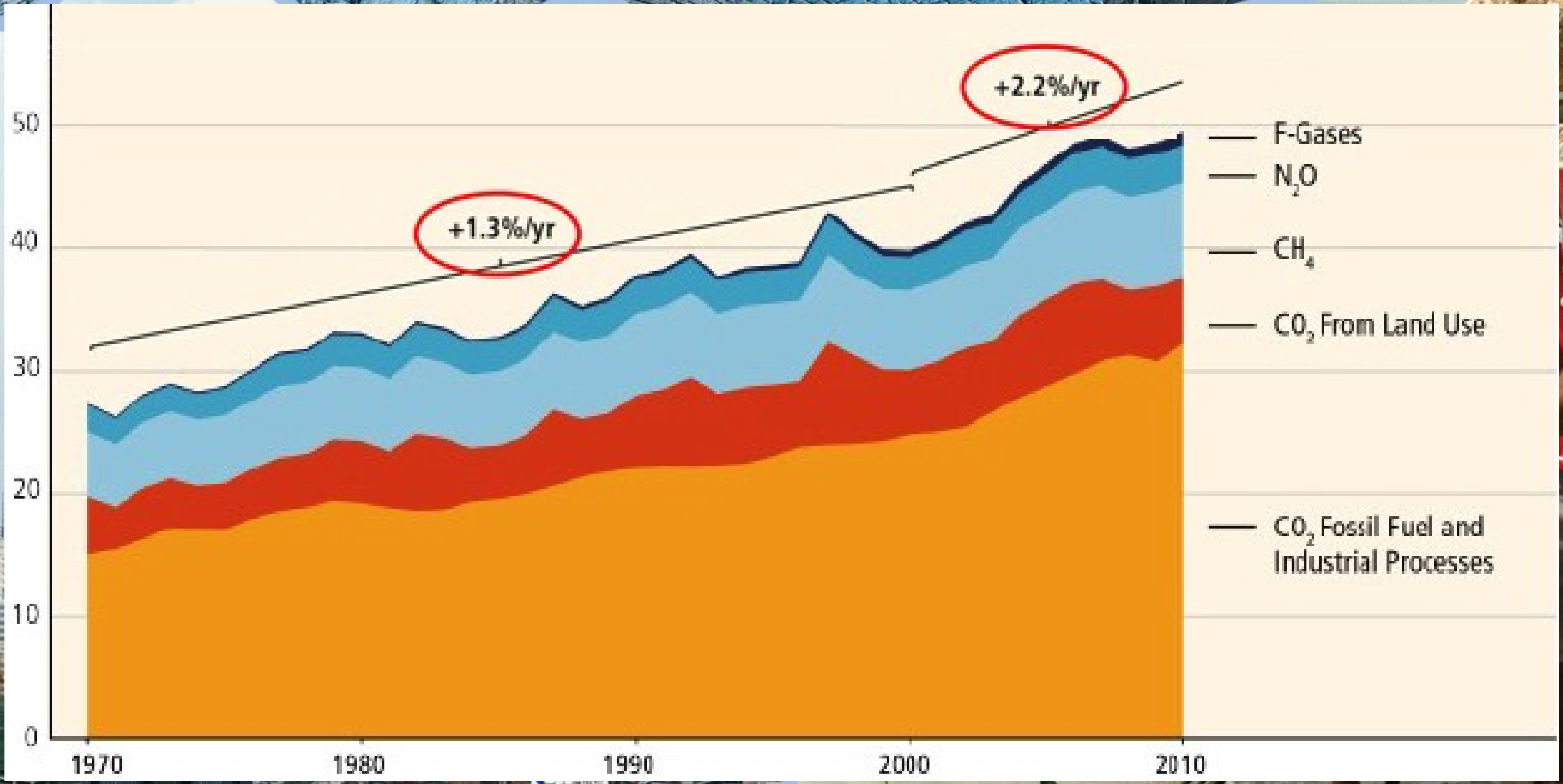
GHG emissions growth between 2000 and 2010 has been larger than in the previous three decades

GHG Emissions [GtCO2 eq/yr]

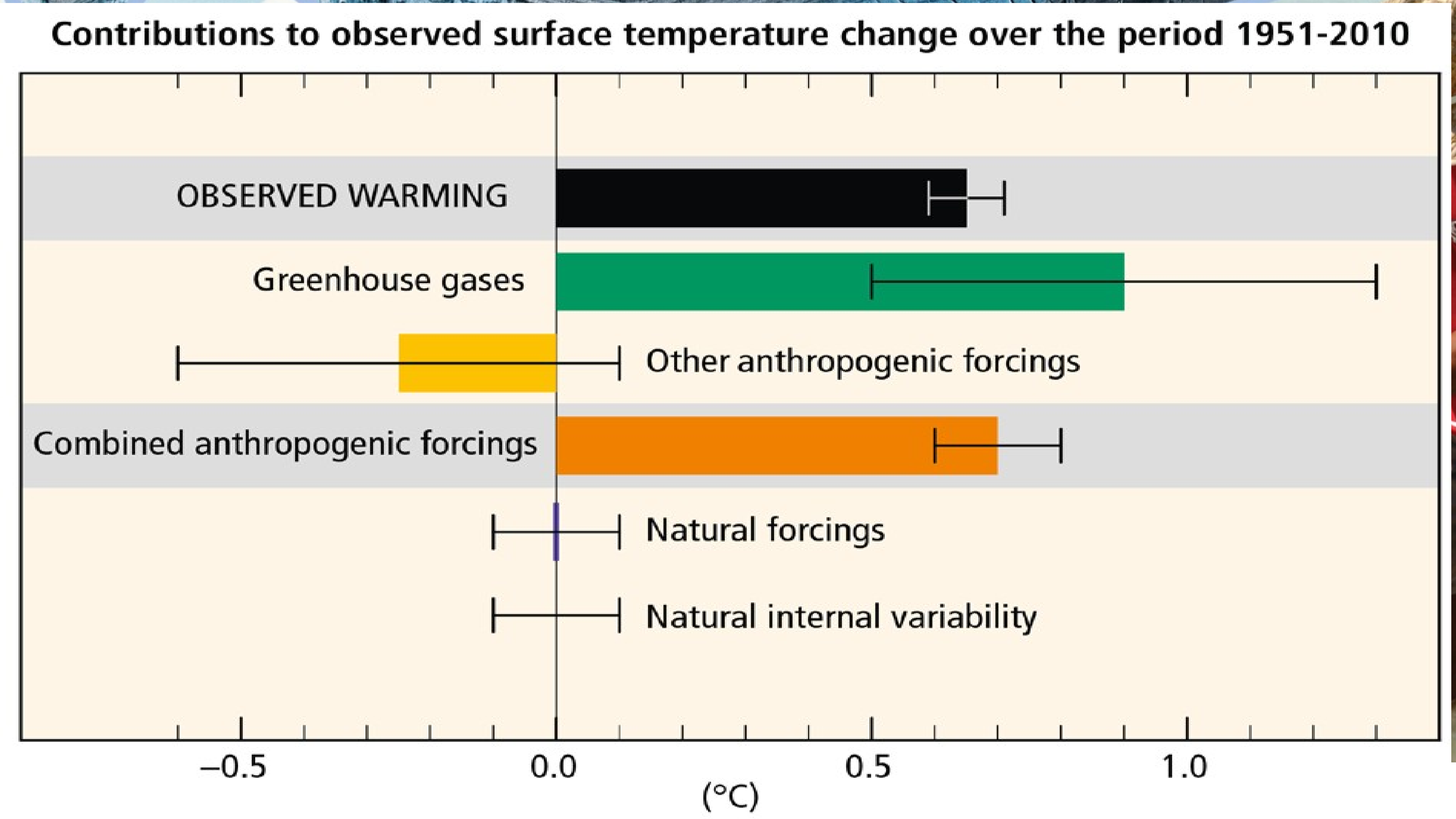


AR5 WGIII SPM

Sources of emissions

Energy production remains the primary driver of GHG emissions

Antropogenic forcings are *extremely likely* the cause of warming



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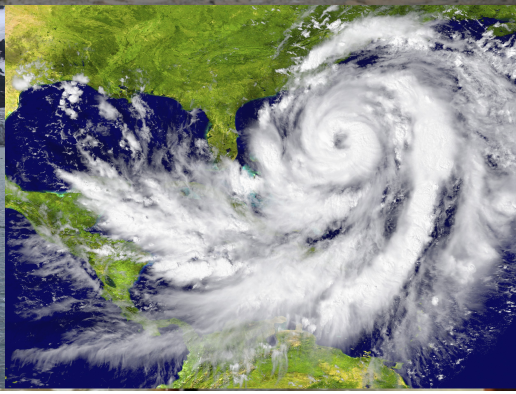
Some of the changes in extreme weather and climate events observed since about 1950 have been linked to human influence





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Impacts are already underway

- Tropics to the poles
- On all continents and in the ocean
- Affecting rich and poor countries

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Projected climate changes

Continued emissions of greenhouse gases will cause further warming and changes in the climate system

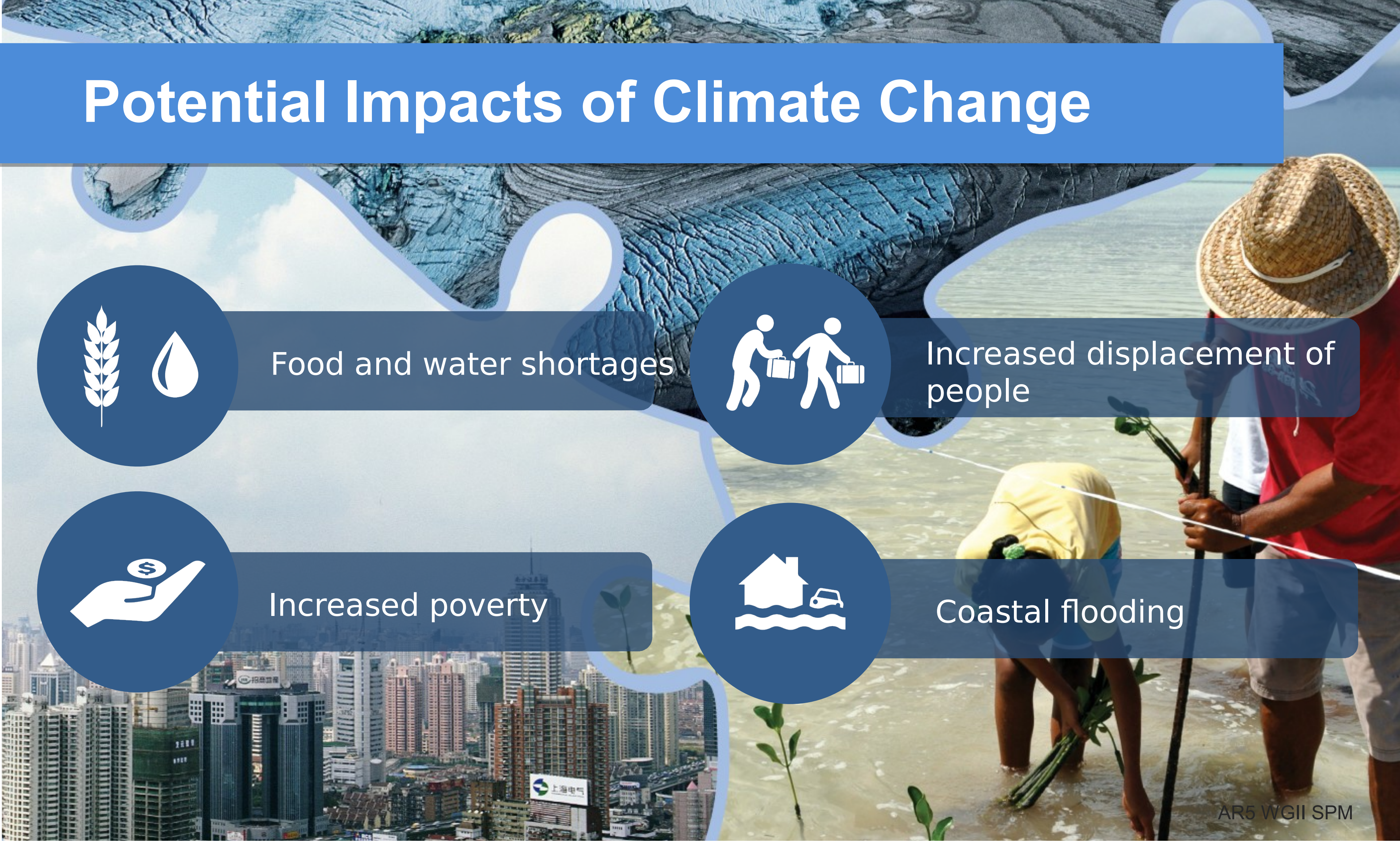
Oceans will continue to warm during the 21st century

Global mean sea level will continue to rise during the 21st century

It is very likely that the Arctic sea ice cover will continue to shrink and thin as global mean surface temperature rises

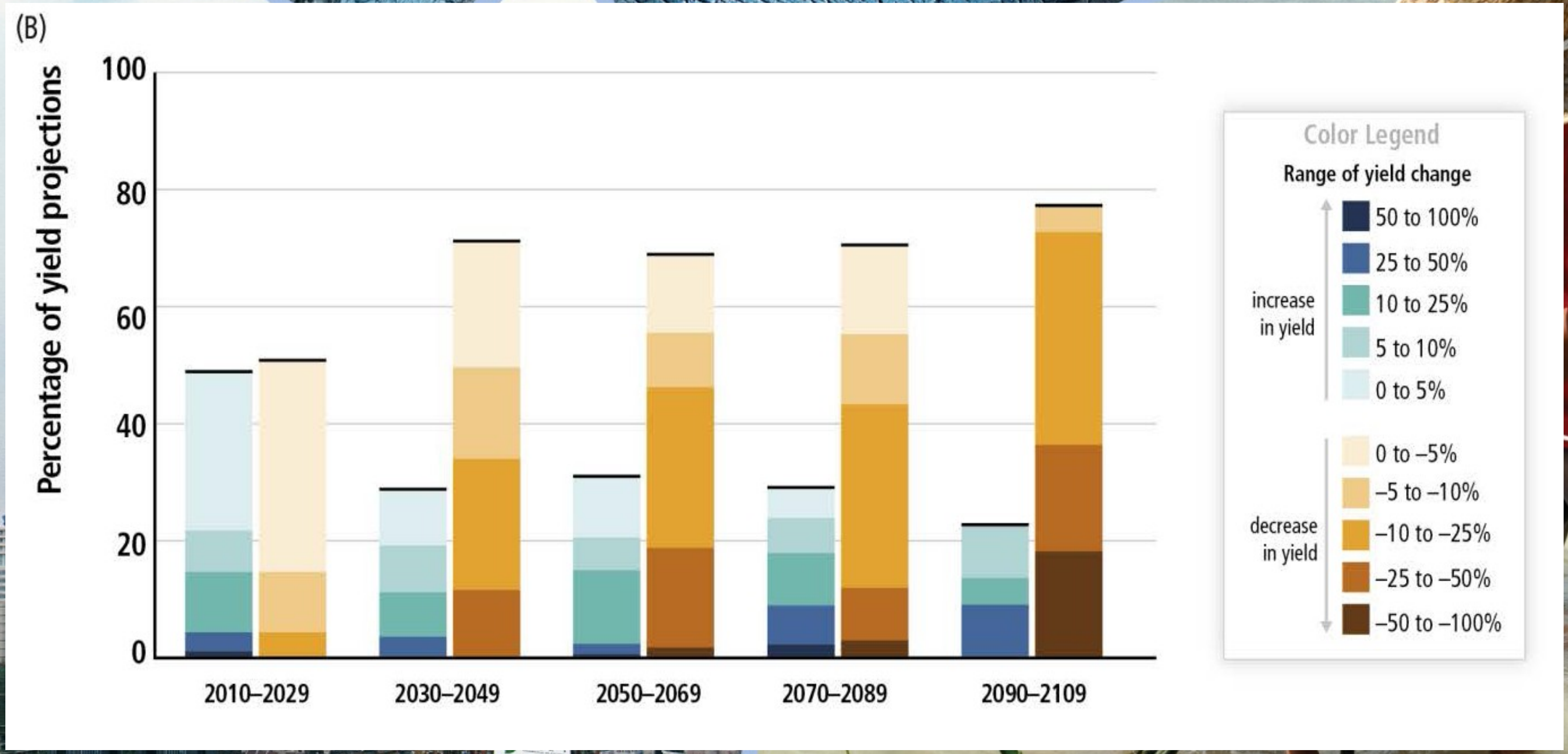
Global glacier volume will further decrease

AR5 WGI SPM


Potential Impacts of Climate Change
Food and water shortages
Increased displacement of people
Increased poverty
Coastal flooding
AR5 WGII SPM

Climate Change Poses Risk for Food Production

Percentage of yield projections



AR5 SYR SPM

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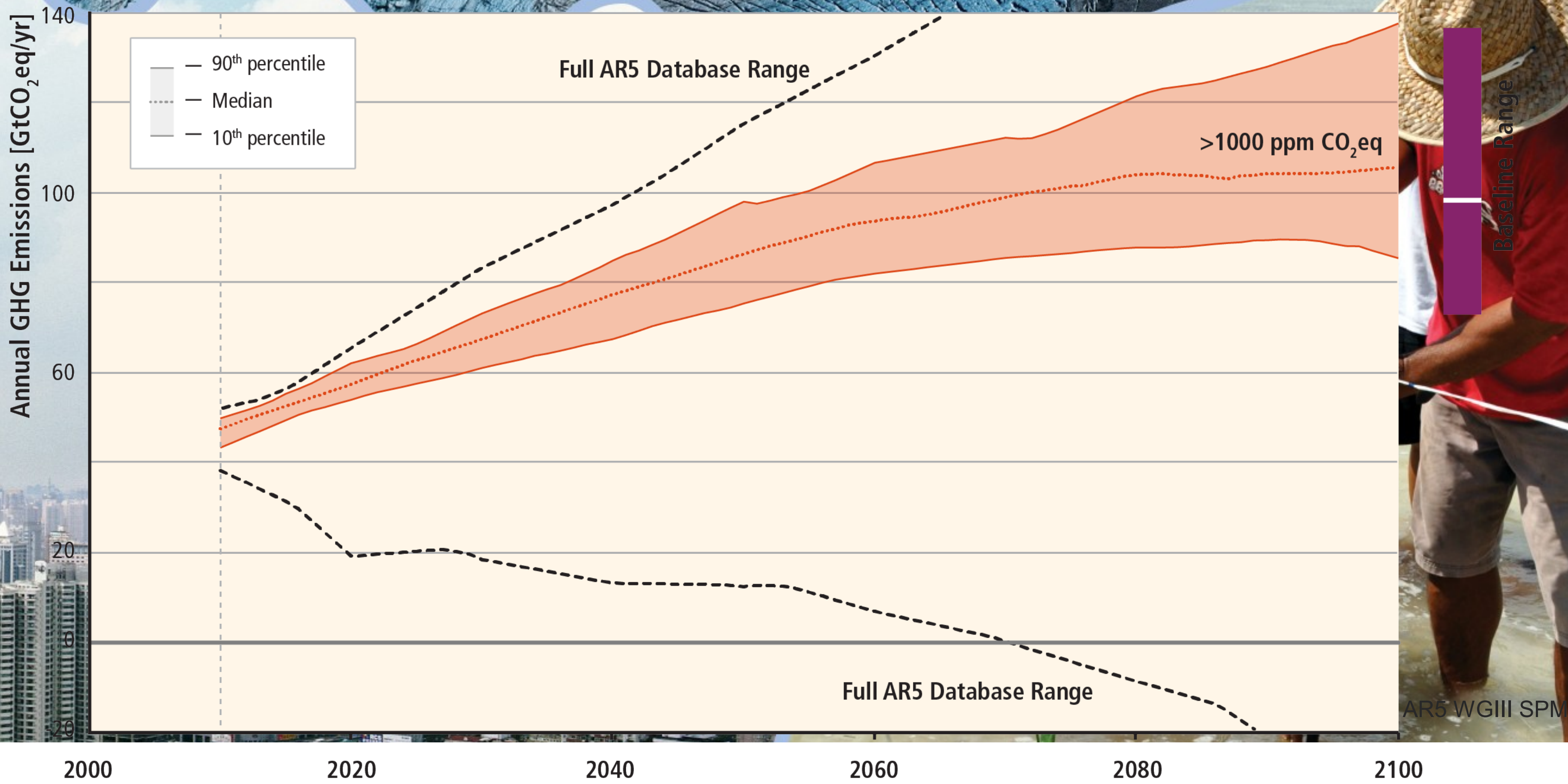
Stabilization of atmospheric concentrations requires moving away from the baseline – regardless of the mitigation goal.

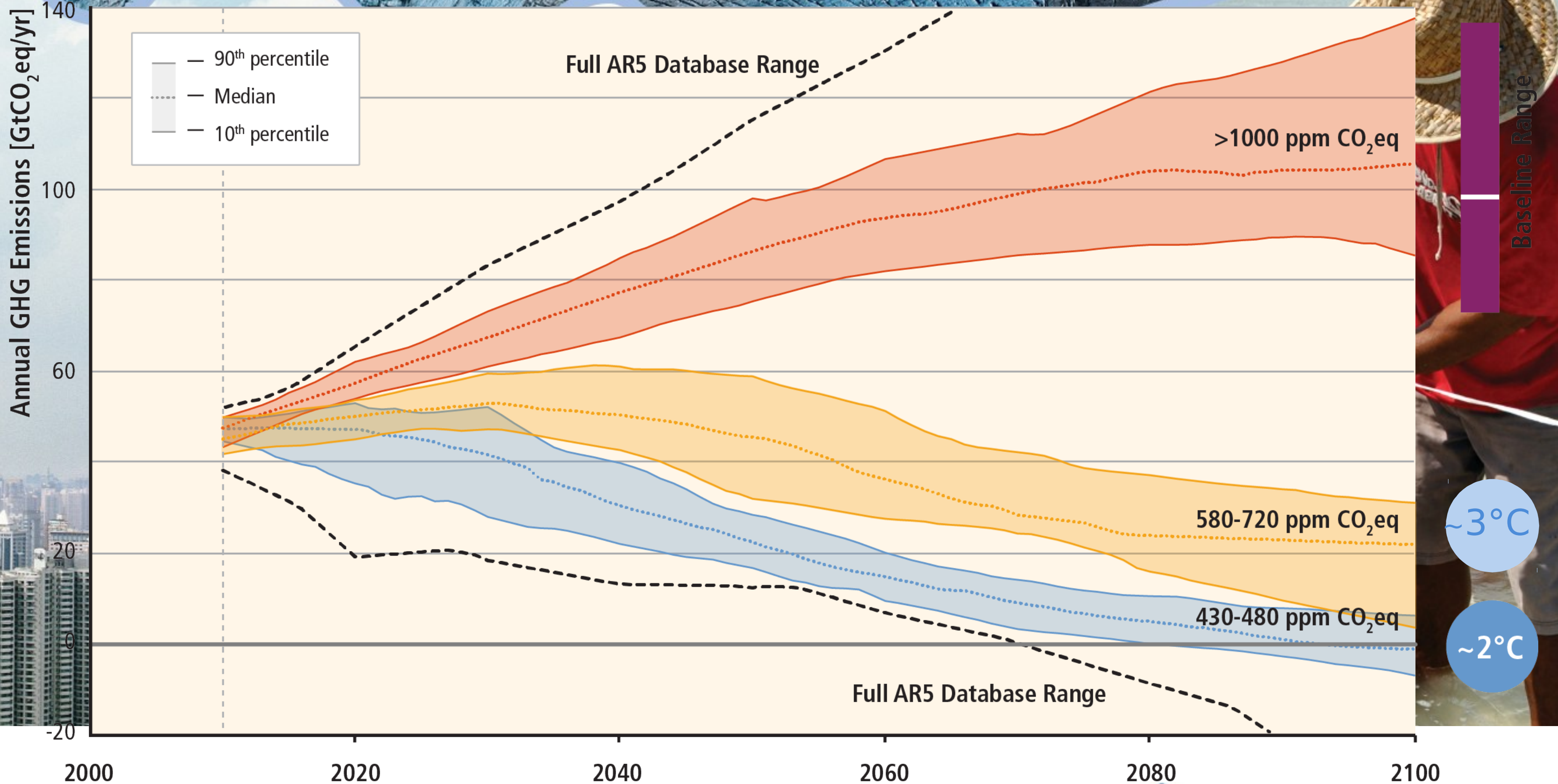


Based on Figure 6.7

IPCC AR5 Synthesis Report

INTERGOVERNMENTAL PANEL ON climate change

Stabilization of atmospheric concentrations requires moving away from the baseline – regardless of the mitigation goal.



Based on Figure 6.7

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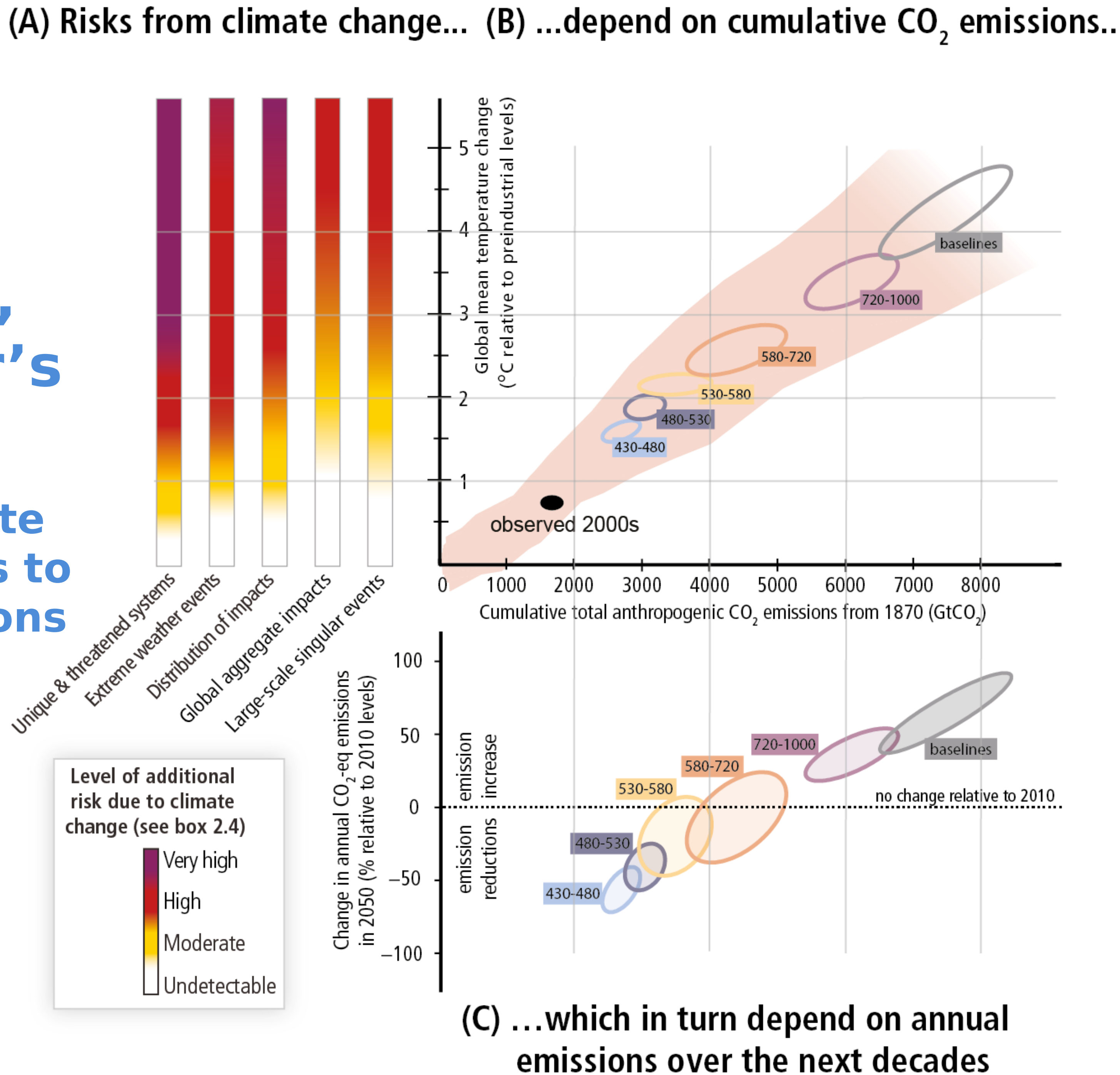
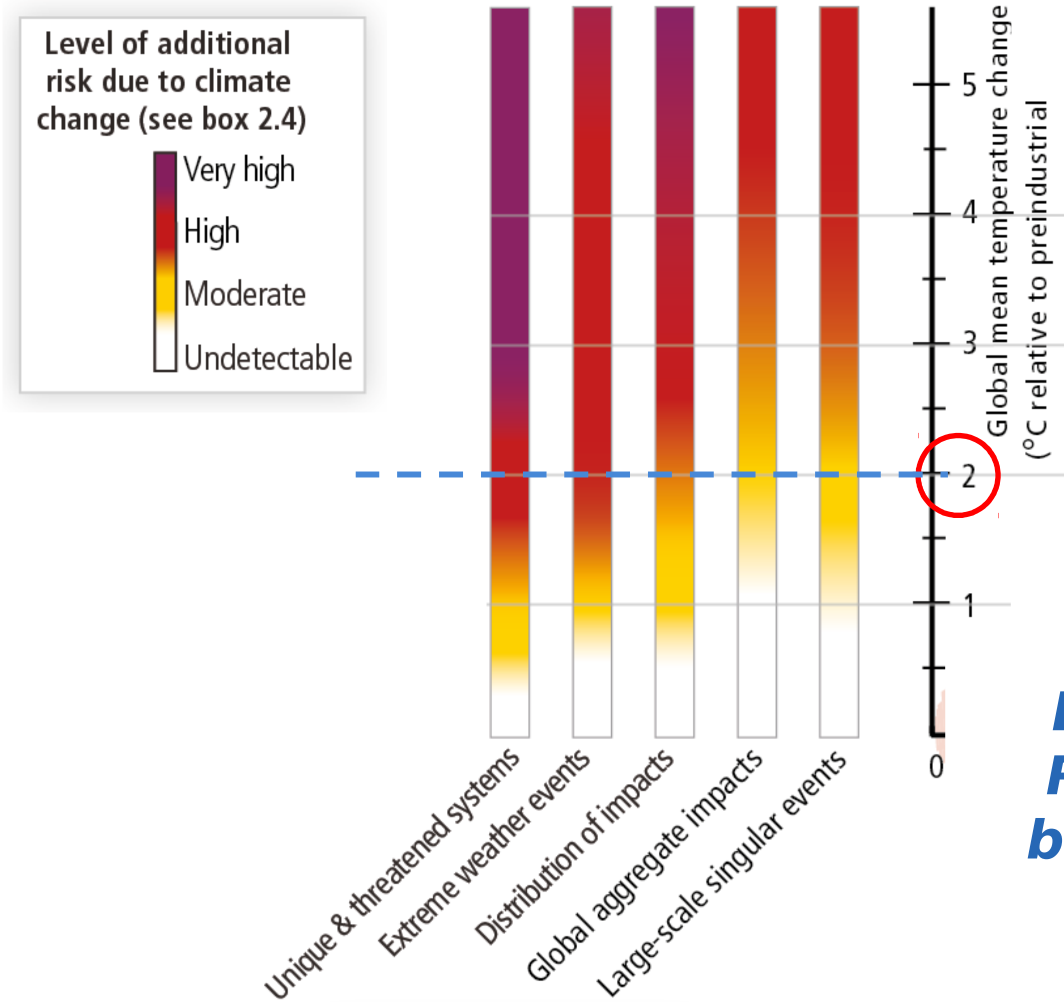
Figure SPM.10, A reader's guide

From climate change risks to GHG emissions

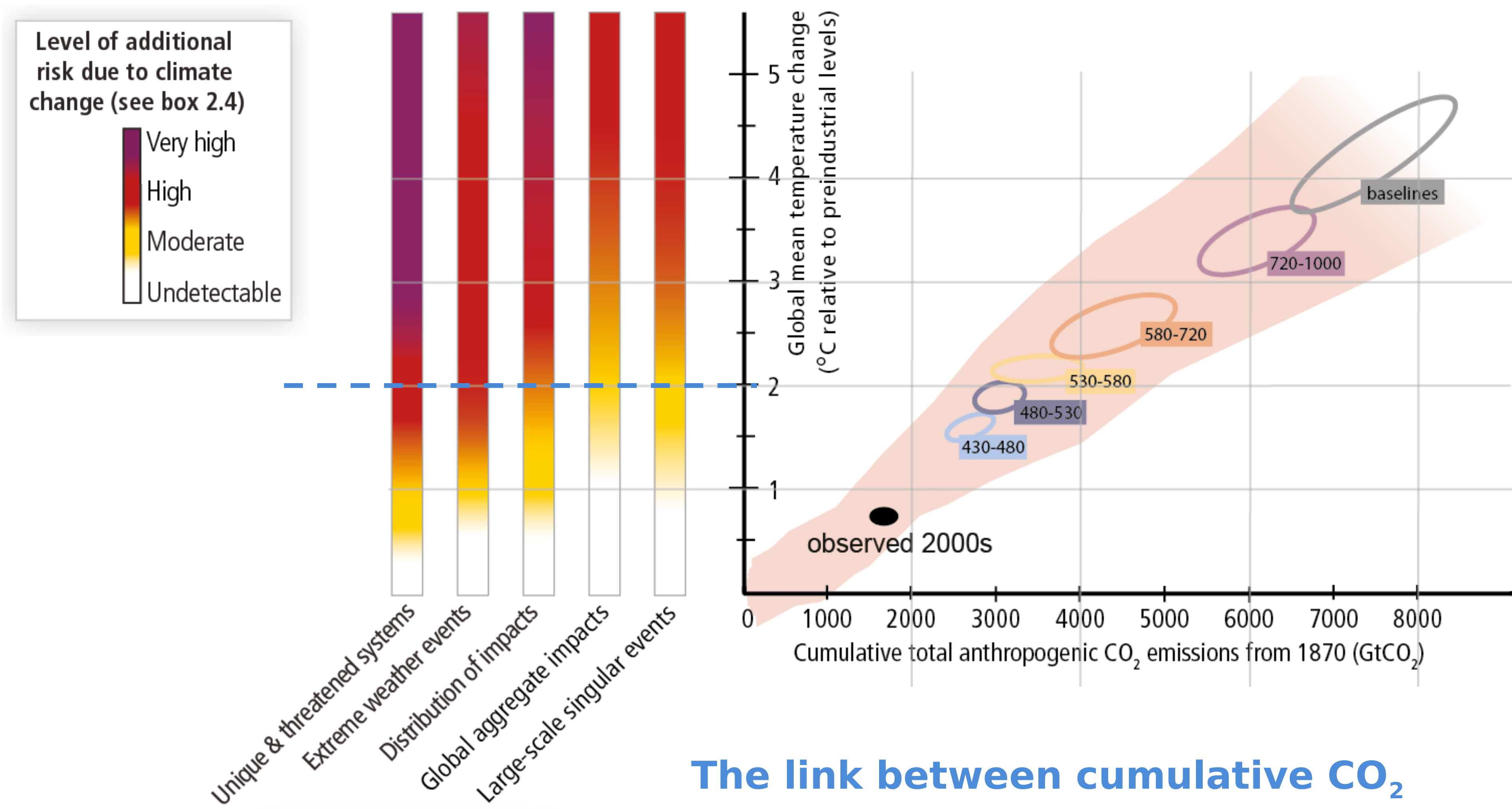




The risks from climate change, assessed by the WGII of the IPCC AR5, and aggregated in five "Reasons for Concerns"

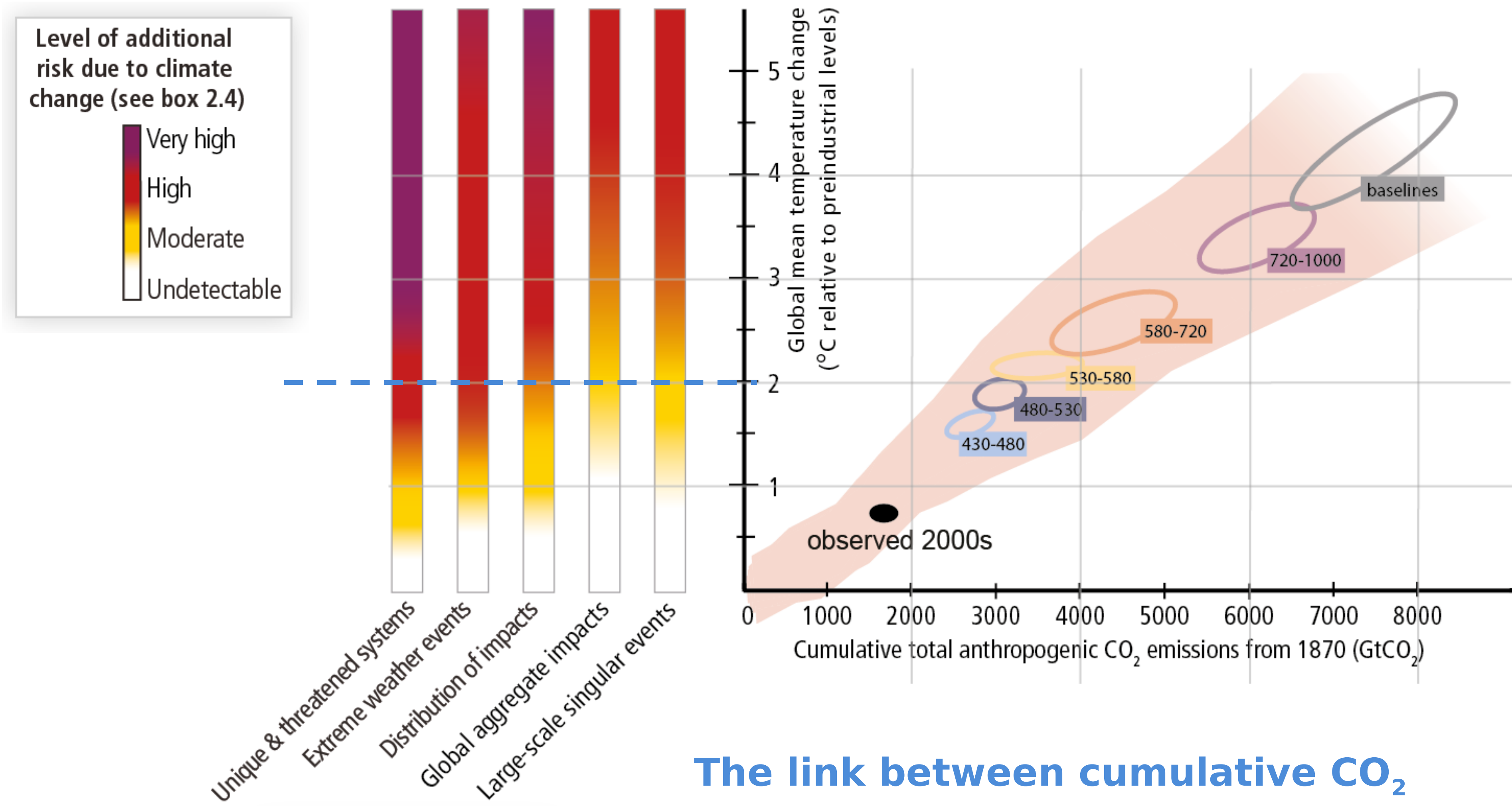
Levels of risk across the Reasons for Concern can be associated with a level of global temperature change.

Here shown for a warming by 2°C



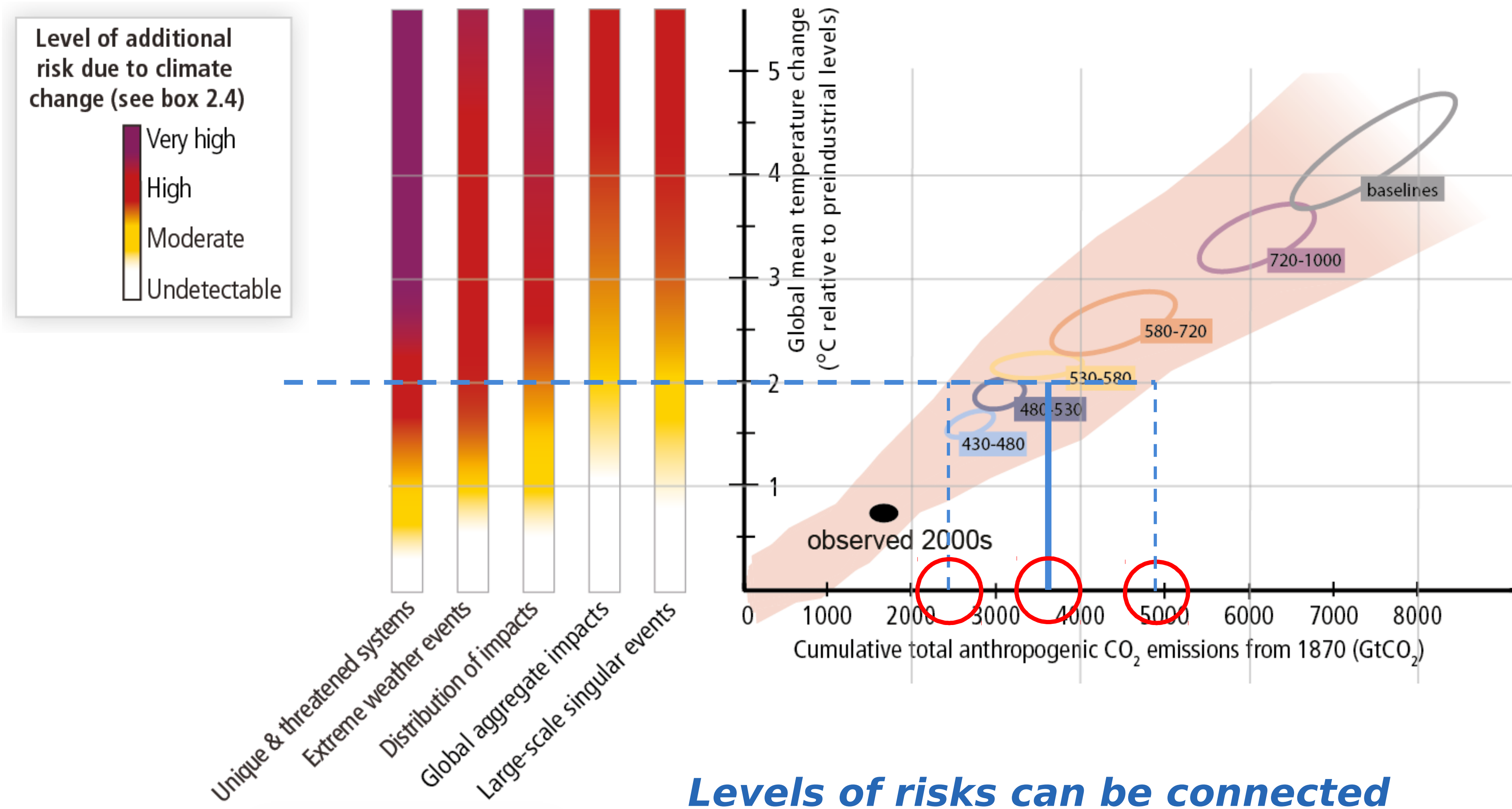
The link between cumulative CO_2 emissions and global mean temperature

The pink plume is from WGI complex models.
It includes the uncertainty from non-CO_2 gases and climate and carbon cycle



The link between cumulative CO_2 emissions and global mean temperature

The ellipses show results from the WGIII models, using a simple climate model. It does not include climate and carbon cycle uncertainty, but explores more



Levels of risks can be connected to cumulative CO_2 emission levels, for the a

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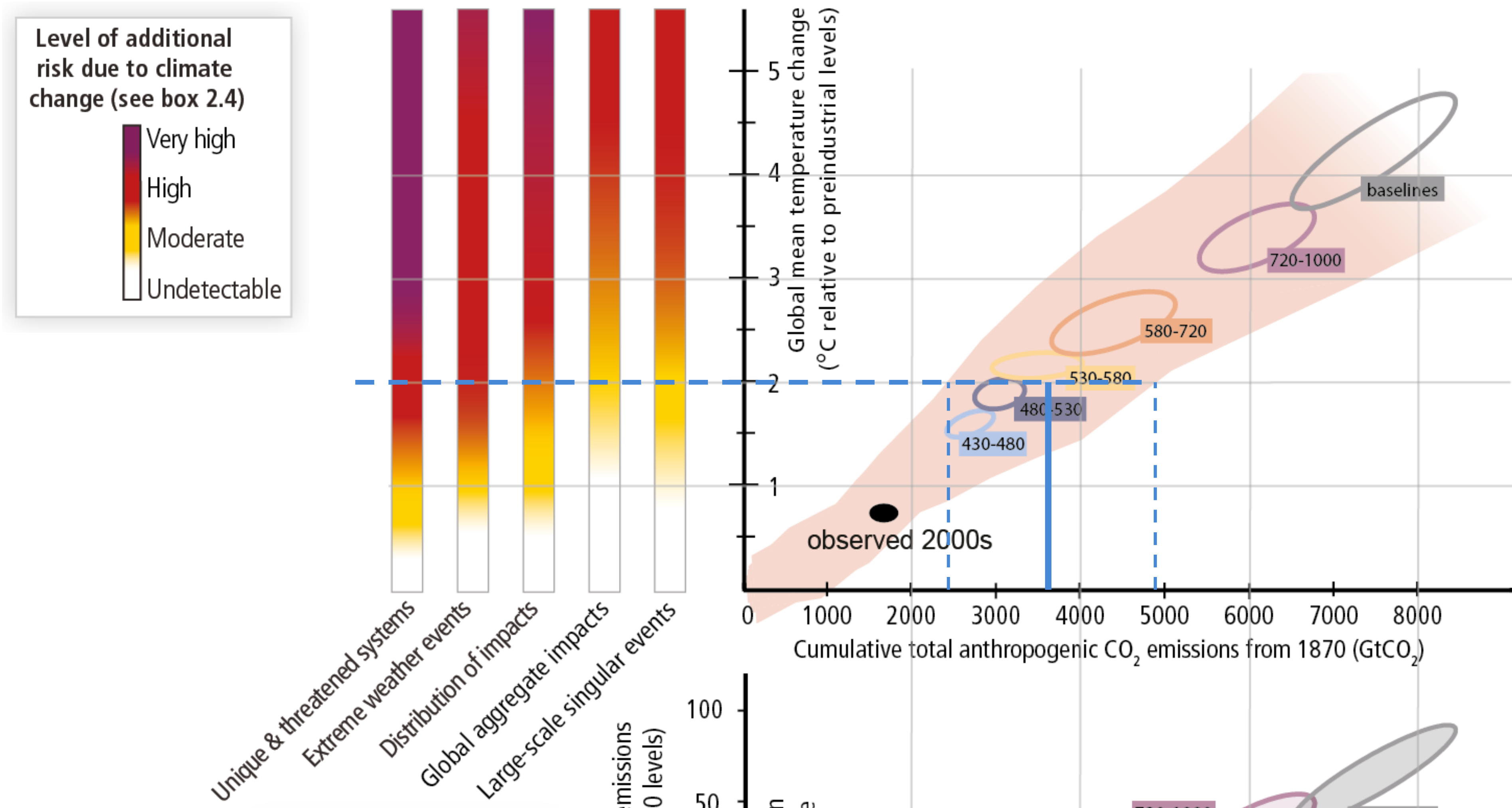
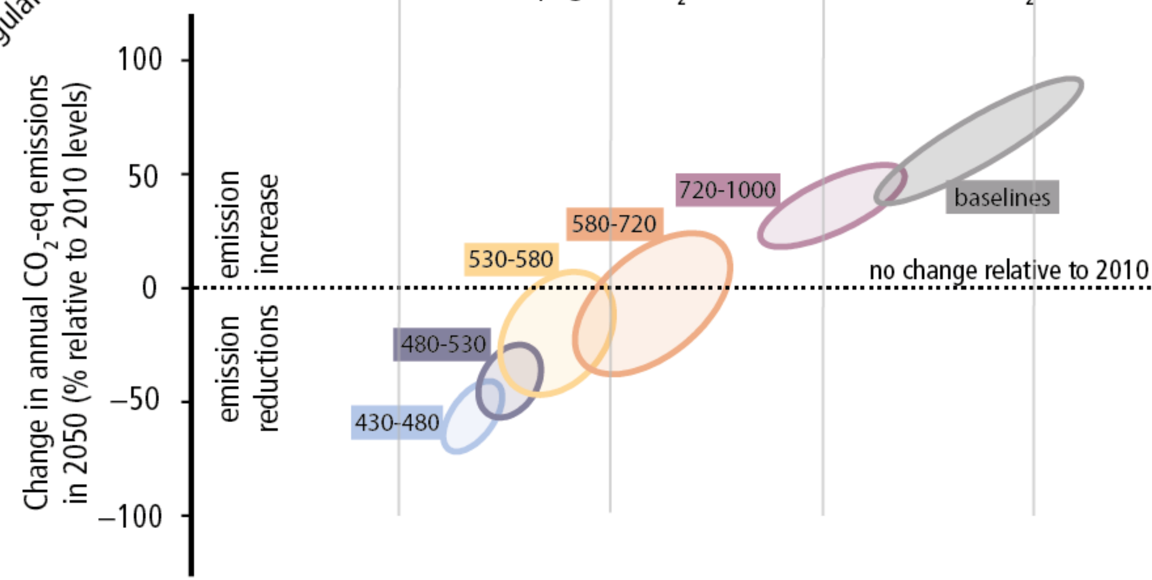
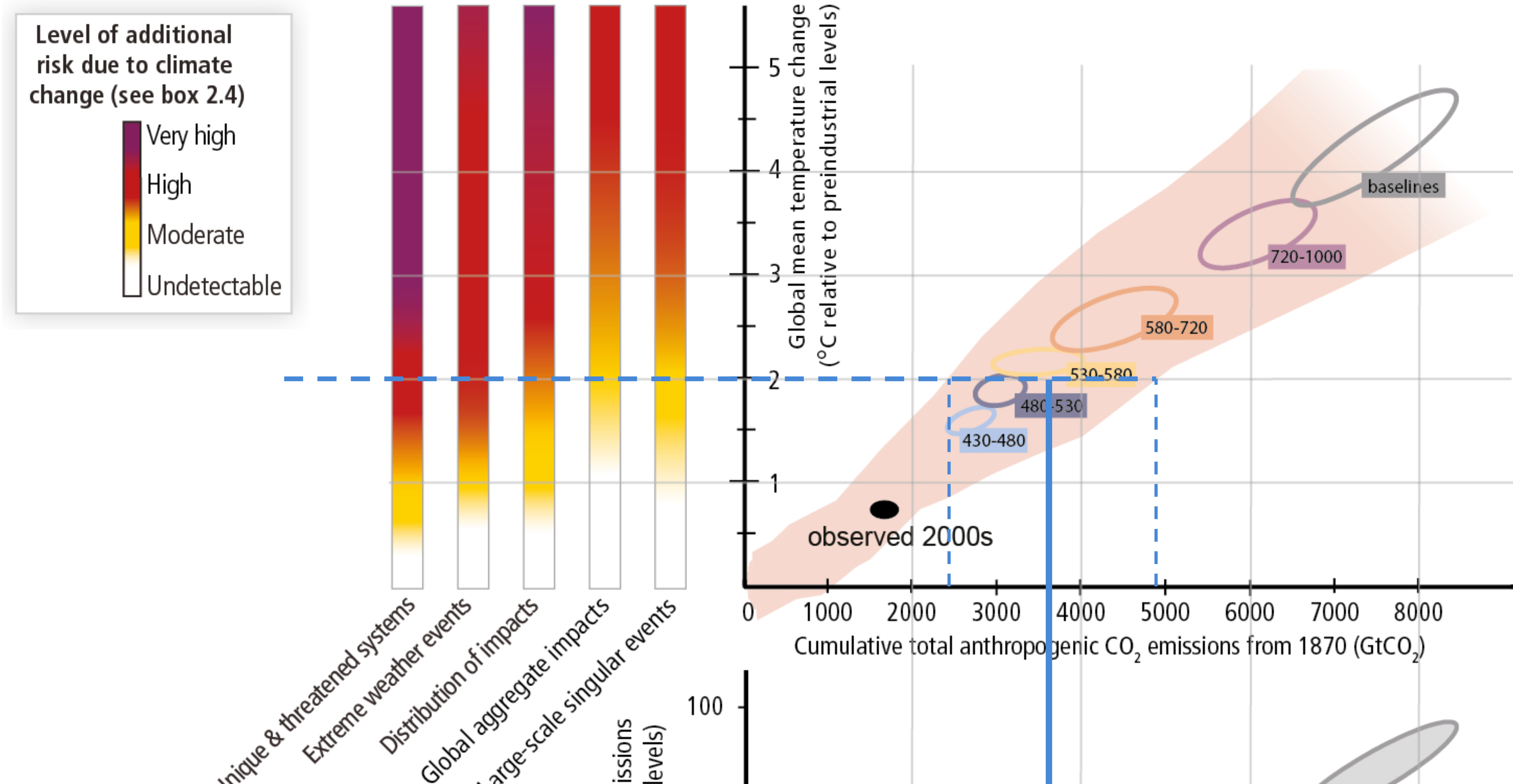
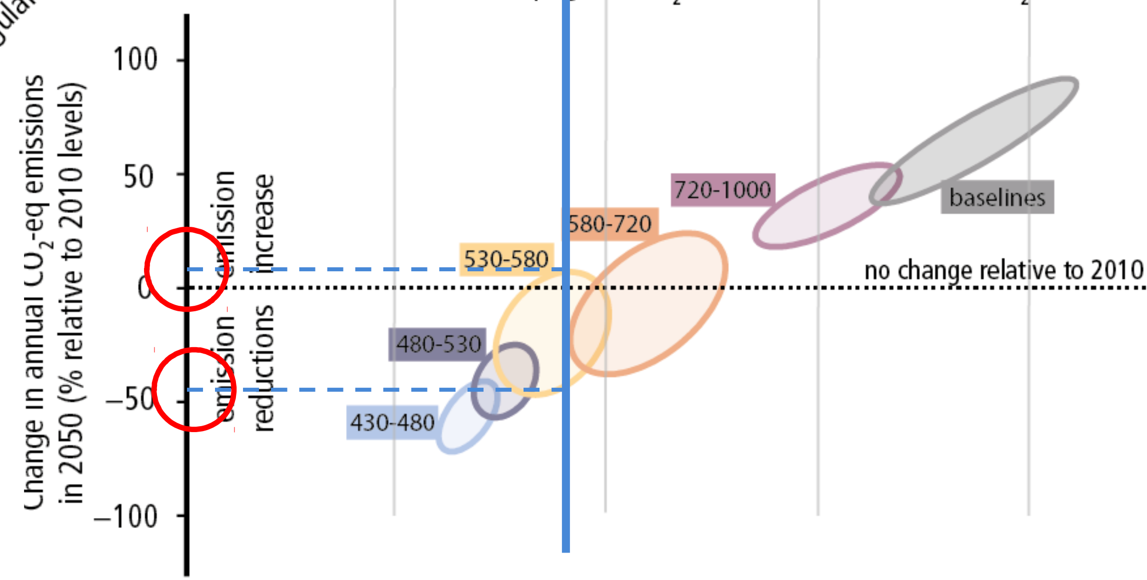
y (higher cumulative emissions)



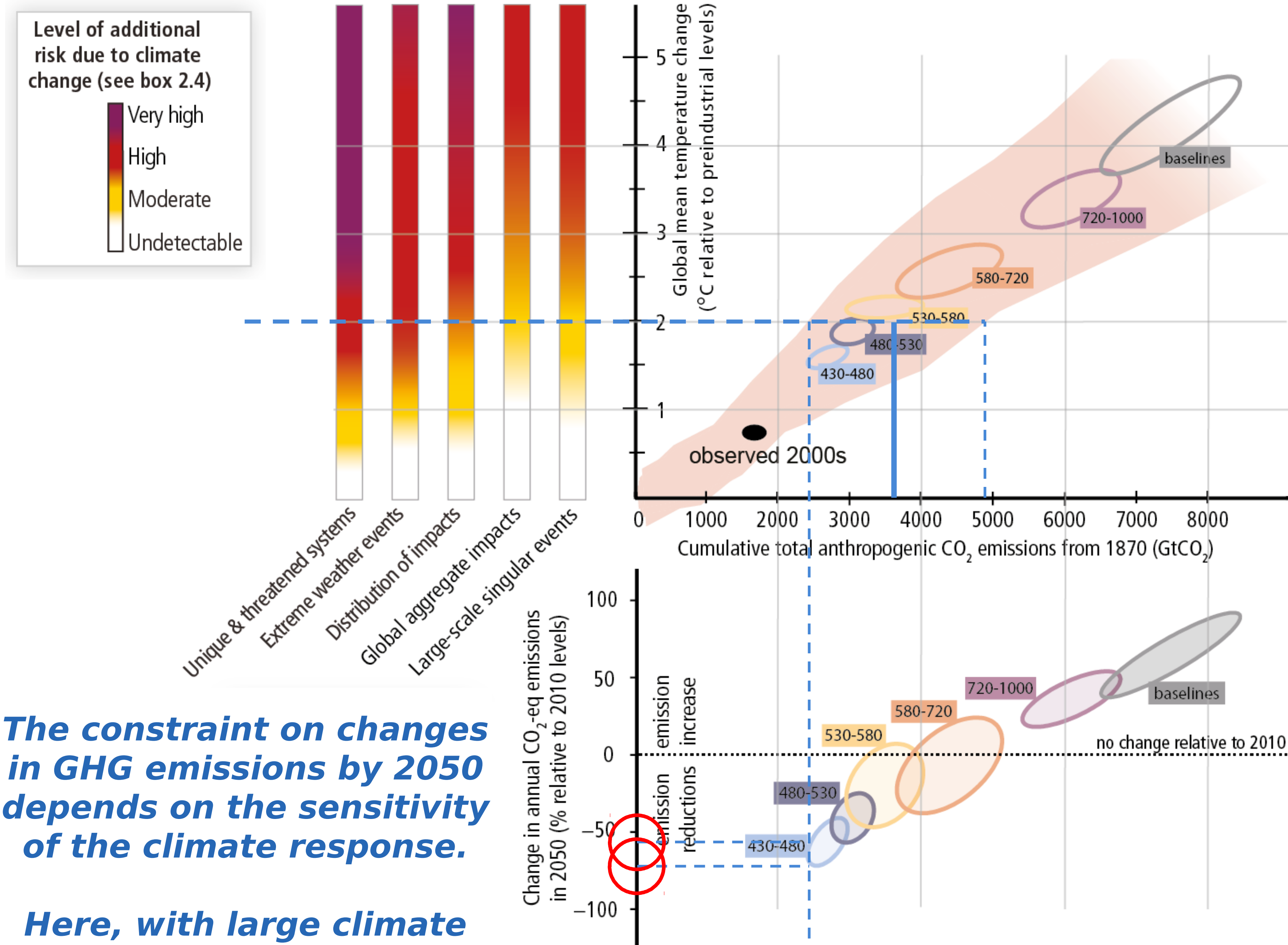


The link between changes in annual GHG emissions by 2050 and the cumulative CO_2 emissions of the WGIII



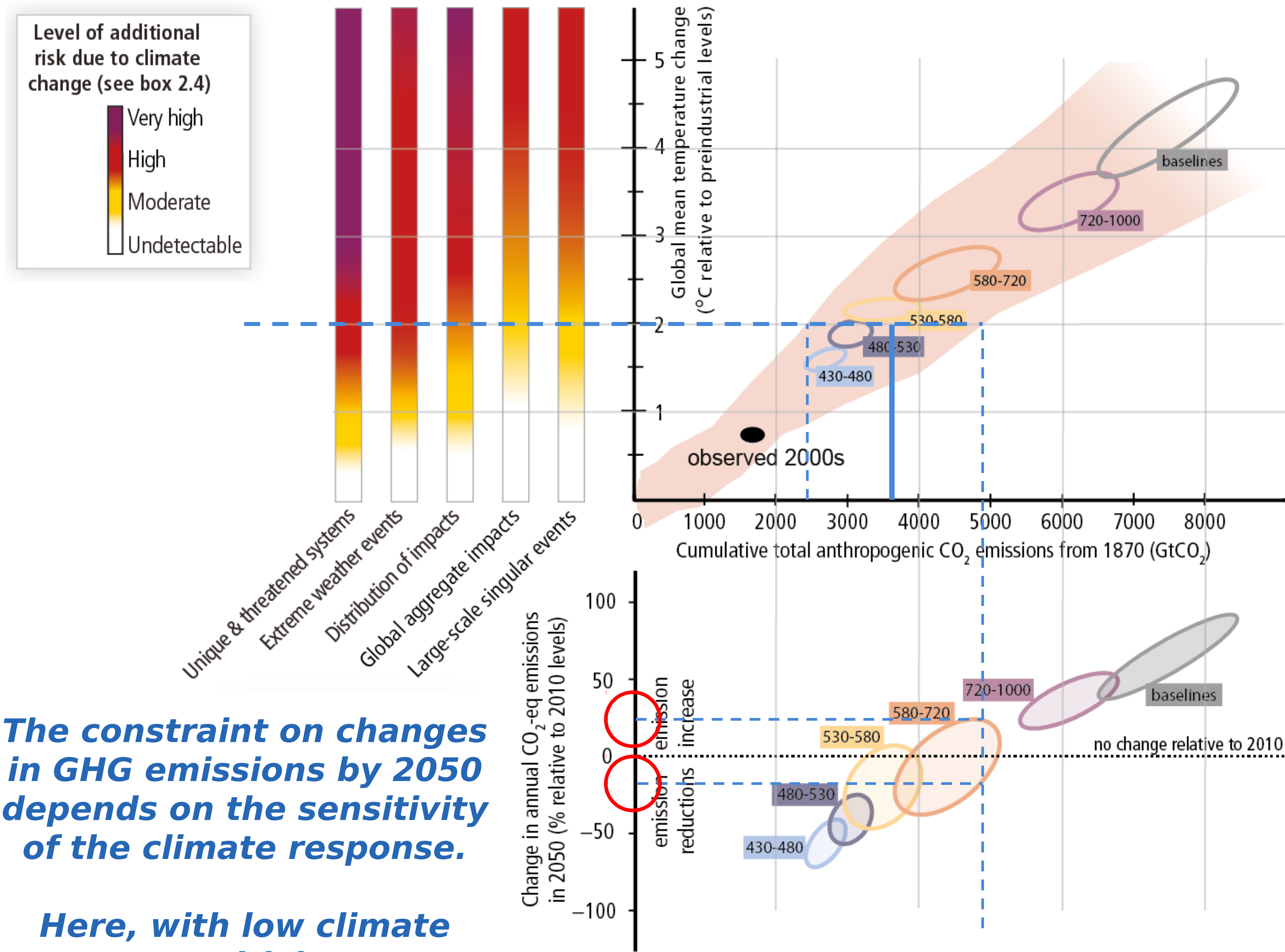


Levels of risks can now be connected to GHG emission changes by 2050. Added uncertainty arises from action on non-CO_2 gases, timing of pre-2050 action, and ambition



The constraint on changes in GHG emissions by 2050 depends on the sensitivity of the climate response.

Here, with large climate sensitivity



The constraint on changes in GHG emissions by 2050 depends on the sensitivity of the climate response.

Here, with low climate sensitivity

Limiting Temperature Increase to 2˚C

Measures exist to achieve the substantial emissions reductions required to limit likely warming to 2°C (40-70% reduction in GHGs globally by 2050 and near zero GHGs in 2100)

A combination of adaptation and substantial, sustained reductions in greenhouse gas emissions can limit climate change risks

Implementing reductions in greenhouse gas emissions poses substantial technological, economic, social, and institutional challenges

But delaying mitigation will substantially increase the challenges associated with limiting warming to 2°C

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Mitigation Measures

More efficient use of energy

Greater use of low-carbon and no-carbon energy

- Many of these technologies exist today

Improved carbon sinks

- Reduced deforestation and improved forest management and planting of new forests
- Bio-energy with carbon capture and storage

Lifestyle and behavioural changes

AR5 WGIII SPM

Ambitious Mitigation Is Affordable

- Economic growth reduced by ~ 0.06%
  (BAU growth 1.6 - 3%)
- This translates into delayed and not forgone growth
- Estimated cost does not account for the benefits of reduced climate change
- Unmitigated climate change would create increasing risks to economic growth

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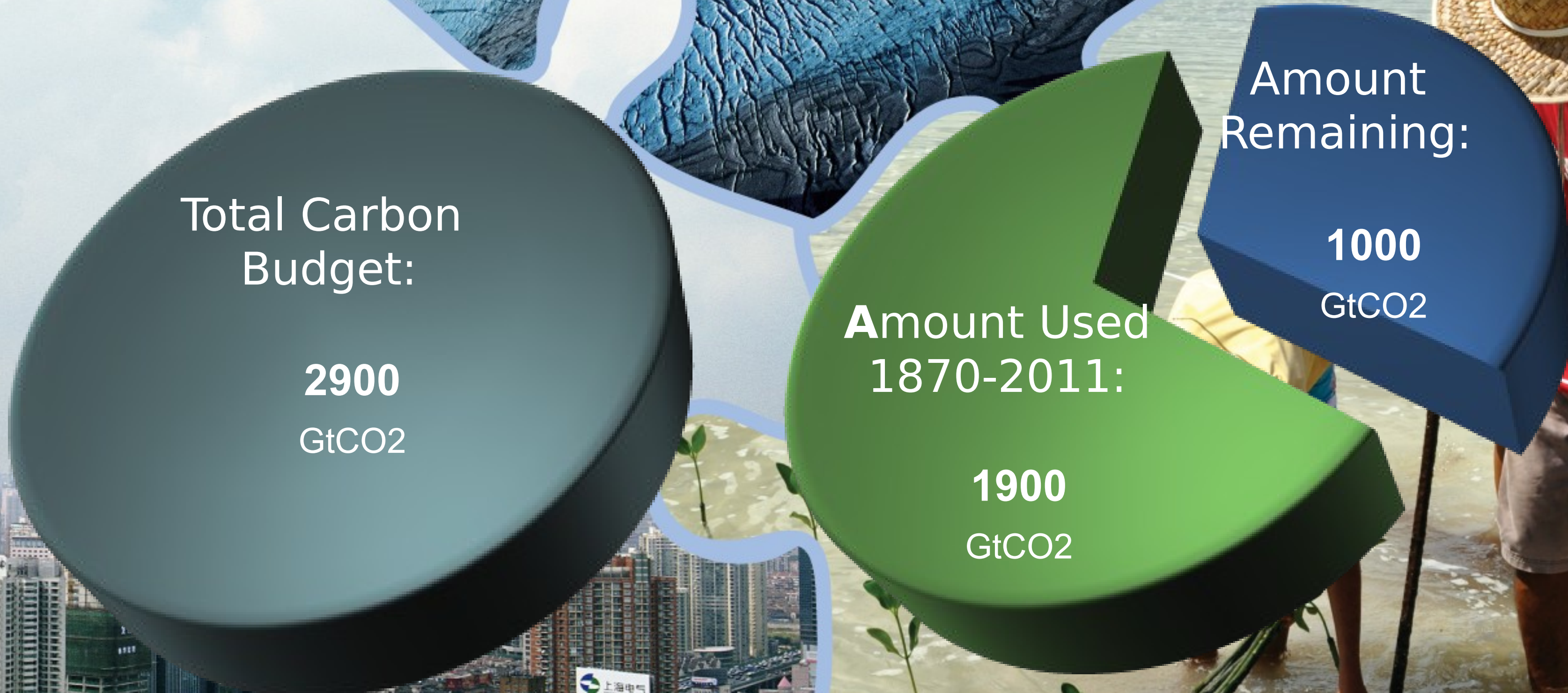
The window for action is rapidly closing

65% of our carbon budget compatible with a 2°C goal already used



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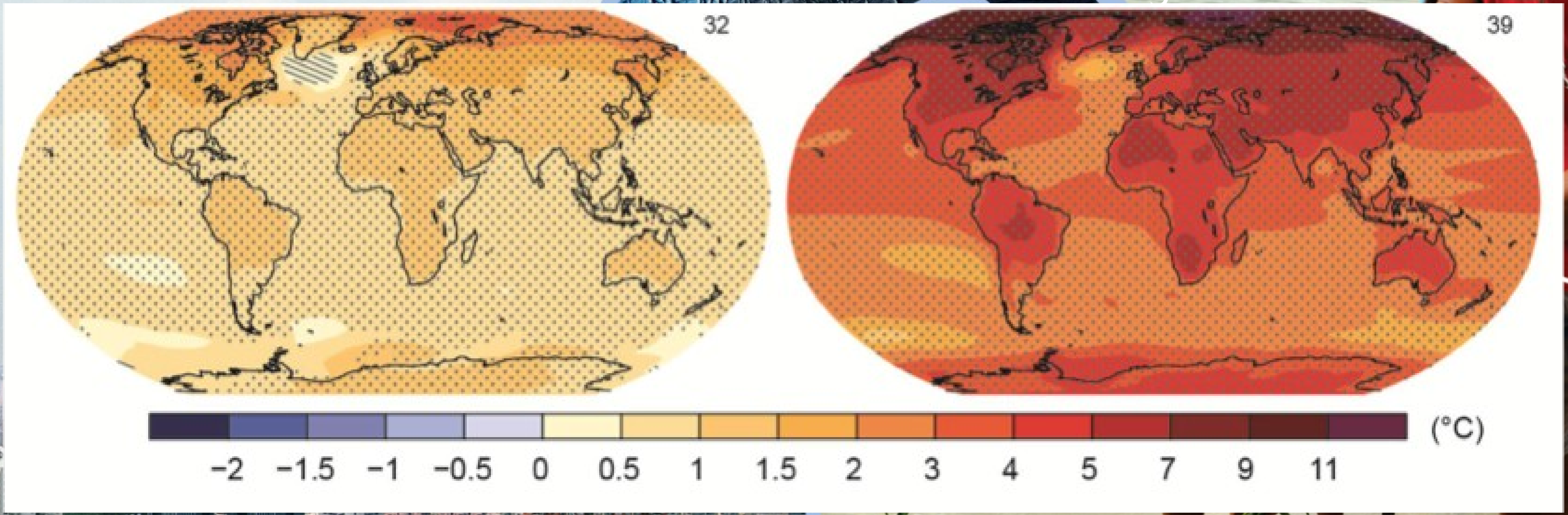
The Choices We Make Will Create Different Outcomes

With substantial mitigation

Without additional mitigation



Change in average surface temperature (1986–2005 to 2081–2100)

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IPCC Fifth Assessment Report

Synthesis Report

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